

COMMAND AND CONTROL AND COMBAT SYSTEMS DISCOVERY AND INVENTION FY08 PROGRAM GUIDANCE

Key Information and Dates

The Office of Naval Research (ONR) Program Guidance is the basis for the formulation of the FY08 Command and Control and Combat Systems (C2 and CS) Program.

The Guidance applies to government and FFRDC entities only.

The C2 and CS website (http://www.onr.navy.mil/forcenet_c2csfy08/) will be the primary means of publicizing all relevant information that is specific to this Guidance. All interested parties are encouraged to visit this website regularly.

Dates to remember:

Pre-Proposal Conference/Industry Day	29 January 2007
White Paper Due Date	12 March 2007
C2CS Program Gathering and Oral Presentations (new starts by invitation)	7 - 11 May 2007
Full Proposal Due Date	15 June 2007

1.0 Background

The D&I investments in the C2 and CS program aim to develop advanced technologies that support Network Centric Warfare operations as envisioned by the FORCEnet concept, with the goal of providing enhanced capabilities and functionality for future C2 and Combat Systems. The resultant technologies will provide a foundation for decision-making and mission execution across command echelons throughout the FORCEnet. The Program seeks to develop hardware and software technologies that (1) provide automated approaches for real-time image processing and analysis; (2) identify and integrate informational content from multiple information sources; (3) offer persistent surveillance of the network and its information space; and (4) provide automatic correlation, fusion, and insight to support decision making. This year, particular emphasis will be on the Automated Information Integration thrust area.

1.1 Purpose of the Guidance

The Office of Naval Research (ONR) Program Guidance is the basis for the formulation of the FY08 Discovery and Invention (D&I) Command and Control and Combat Systems (C2 and CS) Program. It is to be used in preparation for

1. The annual Gathering to be held on 7 – 11 May, 2007 and
2. To generate FY08 proposals (continuing projects and new start efforts).

1.2 Operational Requirements

According to DoD definitions, Command and Control (C2) Systems are “the facilities, equipment, communications, procedures, and personnel essential to a commander for planning, directing, and controlling operations of assigned forces pursuant to the missions assigned.”

In current and future operational environments, such as Global War on Terrorism (GWOT) and Maritime Domain Awareness (MDA), warfighters require technologies evolved to support information needs regardless of location and consistent with the user’s level of command or responsibility and operational situation. To support this need, the DoD has developed the concept of Network Centric Warfare (NCW), defined as “military operations that exploit state-of-the-art information and networking technology to integrate widely dispersed human decision makers, situational and targeting sensors, and forces and weapons into a highly adaptive, comprehensive system to achieve unprecedented mission effectiveness.”

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FORCEnet is the Department of the Navy's operational construct and architectural framework for Naval Warfare in the Information Age that integrates warriors, sensors, networks, command and control, platforms and weapons into a networked, distributed combat force, scalable across the spectrum of conflict from seabed to space and sea to land. The underlying premise of FORCEnet is ready access to information and knowledge, allowing distributed forces to make rapid, accurate decisions leading to desired outcomes. FORCEnet will provide the architecture and building blocks that interconnect sensors, networks, decision aids, weapons, warriors, and supporting systems into a highly adaptive human-centric, comprehensive system. FORCEnet will achieve this in part by relying on pillar Enabling Capabilities products and longer-term Discovery and Invention (D&I) projects.

Net-centric operations include communications and information assurance capabilities to enable all-source data access, multi-source processing, and tailored dissemination to C2 and Intelligence, Surveillance, and Reconnaissance (ISR) users across the network. The operational benefits sought are an increased speed, accuracy and precision of command; distributed self-synchronization; flexibility and adaptability to an operational situation; and decision superiority.

In emerging operational environments, the promise of net-centricity and the potential for persistent and pervasive sensing will create greater demand for (1) techniques to coordinate deployment of multiple diverse sensors; (2) automated processing of large volumes of multi-sensor data; (3) tailored dissemination of information to support decision making to users across the network; and (4) the requirement to securely handle information without exposing intelligence information about the networks or systems to adversaries.

1.3 Technical Background

Current shortfalls in warfighting functionality result from limitations in technology, including:

- ♦ Inability to produce a dynamic, comprehensive, and accurate battlespace picture for the warfighter that integrates tactical intelligence data gathered from multiple intelligence sources.
- ♦ Automated techniques to integrate data (geolocation, detection, and identification) from multiple intelligence sources, in a consistent and timely manner are not available.
- ♦ Automated techniques to support planners in maximizing the information value achievable from multiple deployed sources/sensors are not available.
- ♦ Warfighter and intelligence views are not consistent with nor tailored to mission goals.
- ♦ Accurate and timely information about battlespace objects and events is not available to support warfighter decision making, (includes reliable location, tracking, combat identification, and targeting information).

Because massive amounts of data will be generated by persistent sensors, warfighters will require technologies that not only integrate information from diverse sources, but also provide indications of information significance in ways that support the user's decision needs regardless of location and operational situation. Assuming that object track and identity information is available, automated decision tools that transform this information into actionable knowledge for the decision maker are required. The tools and technologies to resolve these shortfalls must address data fusion, particularly at the Levels 2/3. The various levels of data fusion are further defined below.

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- ♦ Level 1 - Level 1 data fusion combines data from single or multiple sensors and sources to provide the best estimate of objects and events in the battlespace in terms of their position, kinematics (e.g. tracks), identity, or identification features. Such Level 1 information may be of high quality particularly when it leverages multiple sensors to provide robustness to spoofing or deception, reliability in the face of sensor malfunctions, and extended space time coverage due to the diversity of observations. This assumes that such high quality information about objects and events is available as a contributor to situation awareness. In general however, such information is insufficient to provide situation understanding. Human decision makers reason about such information to infer relationships (situation elements) and impacts (threats). In the course of such reasoning humans apply additional contextual information that includes experiences and knowledge of terrain, roads, vehicle or arms capability, past practices, etc.
- ♦ Level 2 - Level 2 data fusion focuses on situation assessment. This requires recognition of objects/entities in the regions of interest, as well as recognizing activities of these objects, and inferring their relationships. Issues that must be addressed include: automated target/object recognition; automated activity recognition from multiple sensors and reports collected and stored for historical analyses; inferring relationships of objects in the scene based on their identities or coordinated behaviors and historical analyses; the capability for the automated system to estimate certainties about object identities and activities; and the capability to request human assistance or additional information from sensors or databases to resolve ambiguities.
- ♦ Level 3 - Level 3 data fusion, threat assessment, requires inferring intent of objects/entities, or groups of objects, in the regions of interest. Issues that need to be addressed include: methods for constructing and learning a wide variety of models of threat behavior; methods for reasoning with uncertain and incomplete information for assessing threats from object activities; methods for efficient data-mining of databases; automated planning for courses of action (COA) to counter suspected threats; requesting human assistance for cognitively challenging situations; and presentation of information and COA in readily understandable forms to people at a variety of levels of command and responsibility.

1.4 Program Goals

The goal of the C2 and CS program is to support the FORCEnet vision by developing measurable advances in technology that can directly enable and support ongoing Naval Enterprise capability enhancements. This will be accomplished by supporting science and technology enablers for decision making and mission execution to achieve battlespace superiority. In future operational environments, warfighters will require technologies evolved to support information needs regardless of location and consistent with the user's level of command or responsibility and operational situation. The C2 and CS program focuses on the development of hardware and software technologies that identify and integrate informational content from multiple sources, leading to decision aids that support user-cognitive processes. This program addresses current warfighter functionality shortfalls in C2 and CS resulting from limitations in technology. These shortfalls include:

- ♦ Information systems do not understand context of user needs
- ♦ Users get little help dealing with information diverse needs
- ♦ Tendency toward information overload
- ♦ Unable to manage and exploit the image-based data

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- ♦ Inability to manage user subscription to information in near real time
- ♦ Inability to merge information across semantic differences

The C2 and CS program is especially interested in applying innovative concepts, technologies, and techniques as described towards solving operational problems in the areas of asymmetric warfare, urban warfare, guerrilla warfare, and port/base security.

2.0 Program Thrusts

The C2 and CS program is focused on efforts that automate the association of objects and events in the battlespace and automatically transform this information into actionable knowledge (e.g., indications and warnings of intent). C2 and CS is supported by four thrusts:

- ♦ Automated Image Understanding
- ♦ Automated Information Integration
- ♦ Persistent Network and Information Monitoring
- ♦ Sensor Management and Allocation for Persistent Surveillance

This year, a particular emphasis will be on the Automated Information Integration thrust area.

2.1 Automated Image Understanding

Imageries are important forms of information for understanding the battle-space situation. Automated image understanding using different modalities of imagery provide the battlefield commander with enhanced situational awareness by fully exploiting the capability of reconnaissance/surveillance platforms. Approximately 40% of imageries collected are not screened due to the number of analysts available. This situation will worsen by an order of magnitude as sensor systems are upgraded, more sensors are added and new systems come on line. One of the goals of this thrust is to develop mathematically rigorous and robust automated image understanding algorithms to accurately recognize and classify objects, leading to activity recognition and threat assessment. Another area of interest is to develop system implementation guidelines and automated image understanding algorithms that can operate optimally under dynamic constraints. These guidelines will allow adaptation to evolving systems architectures, time constraints, processors' availability, and communications bandwidth.

This thrust aims to provide enabling capabilities for anti-terrorism and force protection missions in urban/semi-urban areas and in the Maritime Domain. The algorithms should be able to handle urban clutter and occlusions and treat people as one of the objects. In the Maritime Domain, the algorithms should be able to handle multiple objects on dynamic backgrounds, including crowded shipping channels and port areas and to safeguard fleet perimeters.

Of particular interest to this thrust are novel techniques with rigorous mathematical foundation for:

- ♦ Extraction and representation of image feature, content, and region of interest
- ♦ Creation and management of knowledge base for imageries
- ♦ Association and registration of features, contents, and regions of interest from different imaging sensor modalities
- ♦ Recognition and classification of objects
- ♦ Tracking of objects in different modalities

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- ♦ Activity recognition

2.2 Automated Information Integration

The goal of this thrust is to leverage emerging technologies to manage and exploit sensors and disparate sources of data and to develop approaches and tools for (semi)-automated data integration and reasoning about information from diverse sources in ways that support decision makers with timely, actionable information at operational and tactical levels of command, with an emphasis on missions that are related to GWOT and force protection.

Because massive amounts of data will be generated by sensors (traditional and non-traditional), warfighters require technologies that not only integrate information from diverse sources, but also provide indications of information significance in ways that support the user's decision needs regardless of location and operational situation. The challenge is to provide tools that collect, fuse, and disseminate enormous quantities of data drawn from Naval forces and correlate this information with other data sources (e.g., joint forces, government agencies, coalition partners, commercial organizations) to understand the behavior of all entities in battlespaces (e.g., littoral zones, high seas, land-based, etc.) and to provide a reliable, persistent picture of the battlespace. Each of these battlespaces has differing requirements, resulting in the need for different technologies that make actionable information available regardless of location, time, physical constraints, and data access limitations. Information Integration is the development of tools and techniques that automate information fusion so that warfighters can make rapid, accurate decisions regardless of the operational environment.

2.2.1 Sub-area: Networked Sensors, Multi-Target Detection, Tracking, ID and Tagging

The objective in this sub-area is to pursue advances in achieving an integrated and a consistent target picture in a dynamic evolving multi-target scenario across a network of sensors and platforms, like UAV's, with regard to the demands of the war fighter in real-time and nonreal-time engagements. In networking, the use of the existing algorithms and software, designed for single sensors, on each platform is not sufficient to achieve this objective. In order to establish a unique track, tagging, and ID for each of the multiple targets for persistent surveillance using networked sensors, one is confronted with challenges that arise in integrating data, such as different latency, different sensors and data sources, out-of-order measurements, track breaks, the differing number of targets in the field of view of the sensors, etc. In addition, integration of data from multiple sensors in high clutter/false alarm environments may potentially increase the rate of false tracks at the network level. The aspect-dependent and frequency-dependent sensor detections of most targets and potential land occlusions can lead to sensor dependent probabilities of detection that are unknown to the sensor. Some areas of interest are:

- ♦ Develop tracking, ID and tagging approaches that include feature information and approaches in stressed, maneuvering or stationary, densely spaced targets in Navy/Military scenarios as in GWOT, and sensor configuration as in unmanned vehicles. This sub-area is interested in innovative approaches and high fidelity models for the complex phenomenology that impact tracking and tagging.
- ♦ Develop signal processing techniques and measures to show gains if multiple disparate sensors are employed and data integrated.
- ♦ In coding, develop approaches to enhance and achieve user orthonormality under adverse communication and transmission conditions, as well as performance metrics for analyzing performance improvements achievable in networking.

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- ♦ Methods for optimally controlling the sensors of a multi sensor network are needed. The major challenge involves ensuring that the feedback to the sensor improves the track, ID and tag quality, both at the individual sensor level and the network level.

2.2.2 Sub-area: Uncertainty Management and Data Refinement

This sub-area aims to develop innovative mathematically rigorous methods for combining data from single or multiple sensors and sources to provide the best estimate of objects and events in the battlespace, in terms of their identity, associated error or uncertainty, context, etc. It is understood that such information alone is insufficient to provide threat assessment, but serves as a key enabler for Level 2/3 fusion. Some areas of interest include, but are not limited to the following:

- ♦ Multi-source exploitation and integration of data to minimize the uncertainty of information, while preserving data integrity in the face of various information handling and processing factors that may corrupt the fusion operations, rendering the results incorrect and possibly misleading.
- ♦ Robust mathematical and statistical techniques for propagating uncertainty through the integration process.
- ♦ Algorithms and methods for processing and exploiting massive high-dimensional data sets that may arise from a multitude of disparate sensors and are also comprised of disparate and/or non-traditional data types (e.g., image-based data, text, network-based data, open source, etc.)
- ♦ Methods for representing and exploiting context, metadata, network characteristics of the data, and different ‘views’ of the same information.
- ♦ Tools that allow warfighters to access additional, original information on an as-needed basis to re-evaluate information based on their current situation.

2.2.3 Sub-area: Inference Engines and Knowledge Bases

The goal of this sub-area is to develop mathematically rigorous, and computationally tractable and efficient approaches to Level 2/3 fusion for recognizing activities of agents (objects and people), inferring their relationships, inferring their intentions, and assessing potential threats posed by them. Inferencing methods should be able to utilize disparate information that may include data from networks of (imaging and non-imaging) sensors, human reports, private databases, and open, unstructured sources that may be available on the Web. Inferencing methods should also be able to take into account contextual information such as terrain, roads, weather, communications, doctrine, culture, politics, etc. The technical emphasis of this research is to develop rigorous and efficient methods for building sophisticated Knowledge Bases (KBs), and utilizing KBs in automated reasoning. These include, but are not limited to, the following:

- ♦ Extend recent advances in integrating logic and probability for building robust KBs from diverse, uncertain information sources
- ♦ Develop reasoning methods, such as case-based reasoning or common-sense reasoning, that can work robustly in time-critical situations with uncertain and probabilistic information, absence of full information, or contradictory data
- ♦ Develop modeling and learning methods for building models of activity and intention
- ♦ Develop plan recognition methods for inferring intentions from partially observed activities

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- ♦ Data mining techniques to uncover trends in activity, links among objects, and hidden models of behavior/activity to identify relationships and support intent analyses and course-of-action (COA) alternatives
- ♦ Develop methods for formalizing context and approaches to using context to improve recognition and inferencing through constraining plausible hypotheses.

2.3 Persistent Network and Information Monitoring

Assuring information integrity and confidentiality in mission critical networks is fundamental for Network Centric Warfare. The goal of this thrust is to move beyond simple techniques such as separating data to sensitive and non-sensitive storage or encrypting transmission channels, to methods that can fully utilize and be afforded by the technologies that comprise the network. There is a need for software tools that can securely handle information integration without exposing intelligence information about the networks or systems to our adversaries.

Trust in data and data sources are essential to timely decision making. Assuring information received has not been corrupted while processed, in transit or at rest is impossible without trust in the systems that are responsible for those tasks. The tactical and operational picture of the battlespace is now formed from a complex combination of information gathered from across varied communications media – electronic and physical. Information sharing requirements continue to increase such that shared information cannot reveal more than is needed to coalition partners, but must be communicated with a level of trust and credibility to maintain its original importance or value. A level of protection from inception to use of that information must be communicated. Establishing a capability of persistent surveillance on our networks and systems as well as that of our allies is desired.

Technologies of interest include

- ♦ Algorithms and methods for multipart computation where private data does not need to be disclosed during sharing without losing data relevance.
- ♦ Methods for establishing a level of assurance on information integrity of raw data sources, data integration, as well as processed information.
- ♦ Techniques for establishing and communicating a level of importance of security properties, such as methods for visualization and communication of data relevance.
- ♦ Tools that allow warfighters to establish a level of trust in data without revealing sources and methods of intelligence gathering.
- ♦ Methods for constant and consistent monitoring of risk of possible compromise as data transcend system and network boundaries.
- ♦ Verification tools for rapid assessment of heterogeneous networked systems.

2.4 Sensor Management and Allocation for Persistent Surveillance

Tremendous progress has been made in sensor technology, and as a result, sensors are beginning to proliferate the battlespace. Far less has been done on how to best manage and allocate these sensors. Currently, for the most part, placement and configuration of sensors assets is done manually. These decisions, however, are extremely complicated and are often made in time-critical situations, thus making it likely that even the best operators make suboptimal decisions. Areas of interest include:

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- Techniques for comparing the information content provided by disparate sensor types, so as to provide a means for optimizing the tradeoff of higher-level tracking, detection, classification, and identification algorithms as a function of parameters such as range, bandwidth, wavelength, focal length, weather, etc.
- Techniques for determining the optimal number of UXVs needed for a given mission, and their scheduling and routing so as to achieve persistent surveillance. Both pre-mission planning and real-time on-the-fly adjustments need to be addressed.

The goal of this thrust is to develop advanced decision aids that will assist operators in deploying sensor assets in an optimal or near optimal manner. The thrust seeks solution based on mathematically rigorous techniques (e.g., mathematical optimization) that provide optimal or provably near-optimal solutions.

2.5 Thrust Managers – Contact Information

The Thrust Managers are listed below. Questions of a scientific or technical nature should be directed to the appropriate thrust manager.

- Automated Image Understanding: Dr. Behzad Kamgar-Parsi (kamgarb@onr.navy.mil)
- Persistent Network and Information Monitoring:
 - Ms. Louise Davidson (Louise_Davidson@onr.navy.mil)
 - Dr. Ralph Wachter (Wachter@onr.navy.mil)
- Automated Information Integration:
 - Mr. Gary Toth (tothg@onr.navy.mil)
 - Dr. Rabinder Madan, Section 2.2.1, (madanr@onr.navy.mil)
 - Dr. Wendy Martinez, Section 2.2.2 (martinwe@onr.navy.mil)
 - Dr. Behzad Kamgar-Parsi, Section 2.2.3 (kamgarb@onr.navy.mil)
- Sensor Management and Allocation: Dr. Don Wagner (wagnerd@onr.navy.mil)

Questions of a business or programmatic nature should be sent to Dr. Wendy Martinez (martinwe@onr.navy.mil).

3.0 Other Considerations

3.1 Interactions

The ONR Discovery and Invention FY08 Command and Control and Combat Systems (C2 & CS) Program seeks to vertically integrate mature 6.1 research products as well as COTS into its developmental efforts. Teaming arrangements are encouraged between Navy Labs, industry and Universities. When teaming arrangements are made, it should so be stated in the proposal along with a discussion of the effort. Proposals that formulate joint inter-laboratory projects and/or strategic alliances with other Navy Warfare Centers or other Service laboratories are positive aspects in supporting network centric warfare operations. It is assumed from these alliances that: (1) technical expertise can be more fully exploited across a wider pool of resources; interoperability issues between subsystems will be reduced; (2) software, hardware, and middleware can be more easily integrated for purposes of Fleet experiment and/or eventual product transition into FNCs; (3) inter-project integration will be more easily achieved, thereby maximizing the return on investment; and (4) Network Centric Warfare concepts, due to changing warfighting strategy, can co-evolve with technology development through incorporation of users' feedback and testing early in the development cycle.

To support the transition process, Principal Investigators (PIs) are encouraged to interact with N-Code sponsors, SYSCOM Acquisition Managers, and EC (Enabling Capability) Managers. The Project Officer

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may wish to limit or extend the scope of these activities and should not be caught off guard by learning about PI involvement from a third party.

In addition, ONR Project Officers are frequently called upon to provide information to ONR headquarters staff about: project technical accomplishments; transition of D&I work to fleet and other funded programs; interactions with user and other Washington communities; Navy uniqueness of the investment; and Navy payoff (metrics stating how a piece of software, hardware or technology performs faster, more efficient, or more accurately than an existing capability). E-mails from a PI to an ONR Program Manager or Project Officer are strongly encouraged when significant events occur in order to keep ONR upper management aware of progress and achievements being made in the Program.

3.2 COTS/NON-COTS Solutions

The use of COTS technology and industry standards is highly encouraged, when practical, to reduce development cost and increase interoperability. However, the risk as well as the gain of using COTS must be examined carefully; non-COTS products may provide the most appropriate solutions to specific warfighter requirements and the costs and benefits of such a solution have to be considered. Software must anticipate heterogeneous network-based operations and maintain portability across platforms by using software development languages such as Java. Efforts for the C2 and Combat System technology program should be consistent with Joint Vision 2020, naval network centric operations or other naval requirements documentation.

4.0 Proposal Process

4.1 General Information on the Process

There are two main paths in the proposal process described in this Guidance for projects that are:

- (1) ***Continuing*** efforts and
- (2) ***New start*** efforts. (A new start effort is one that has no relation to earlier work.)

Here is a general overview of the two paths; more information is provided in the following paragraphs.

Continuing: PIs for continuing projects must attend the annual Gathering and brief the status of the project and their accomplishments. PIs must also submit a proposal to continue their project.

New Starts: PIs with new start efforts must first submit a white paper. These white papers will be reviewed by a panel using the evaluation criteria specified in this Guidance. Projects that are considered as being of particular value to the Navy will be selected for oral presentation at the annual Gathering. PIs with efforts that are still considered worthwhile after the oral presentation will be encouraged to submit a full proposal. Note that oral presentations and full proposals are not a guarantee of funding.

4.2 C2CS Program Gathering

The ONR Discovery and Invention C2 and Combat Systems Program Gathering will take place **7 – 11 May, 2007**. The Gathering is a venue for

1. A review of the current program and
2. Oral presentations for proposed FY08 new start efforts.

The Program Gathering is mandatory for all currently funded Principal Investigators. The first day's agenda will provide key insights into the program direction, describe program changes that have occurred in the past year, and present new information on critical topics of naval interest. Attendance records will be maintained, and any absences must be coordinated in advance with the Program Manager.

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Mature projects are expected to demonstrate prototype technology developments with an emphasis on inter-project relationships, EC transition opportunities and D&I technology application to naval problems. A briefing template will be provided to ensure that required information is included in the presentation. In particular, each briefing must include a quad chart that includes key program information and notes for use by the Program Manager. A quad chart template is at the end of this document and will also be posted to the C2 and CS website (http://www.onr.navy.mil/forcenet_c2csfy08/).

Attendees are required to register for the Gathering. For more information on the Gathering and the registration process, see the C2 and CS website.

4.3 Pre-Proposal Conference/Industry Day

ONR will conduct an Industry Day Briefing. It is scheduled for **29 January 2007**. The purpose of the briefing is to provide a better understanding of the C2CS program. For the location and time, refer to the C2 and CS website (http://www.onr.navy.mil/forcenet_c2csfy08/).

Registration: Interested parties MUST register for the Industry Day Briefing at the C2 and CS website http://www.onr.navy.mil/forcenet_c2csfy08/. The deadline to register is two days PRIOR to the event. If requested attendance exceeds capacity, it may be necessary to limit attendance of personnel from each organization, and organizations will be so notified.

If Not Able to Attend: Those not able to attend this briefing should consult the C2 and CS website to see briefing slides and answers to written questions submitted during the event.

4.4 New Start Projects – White Papers

For new start proposals, a white paper (see Section 5 for information on format and content) must be provided by **March 12, 2007**. All white papers must:

- *Clearly identify the program thrust addressed;*
- *Distinctly address the NAVAL impact/payoff of the project;*
- *Include a quad chart;*
- *Follow the specified format;*
- *Provide phone numbers and e-mail addresses for the Principal Investigators.*

All white papers will be forwarded electronically to the individuals identified below:

Program Manager:

Gary Toth
tothg@onr.navy.mil

Program Officer:

Dr. Wendy Martinez
martinwe@onr.navy.mil

4.5 New Start Projects – Oral Presentation

The purpose of the oral presentation is to better understand the proposed research and technology. *Selected new start project leads will be invited to brief at the Gathering, although this briefing does not constitute a funding guarantee.* PIs for projects selected for oral presentation will be notified on or about **April 2, 2007**, so they can make plans to attend the Gathering. A detailed format for the presentation will be provided in the e-mail notification.

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Those PIs whose research is still considered to be of value to the Navy after evaluation of the oral presentations will be encouraged to submit detailed technical and cost proposals. Notice of encouragement to submit full proposals will be issued on or about **28 May 2007**.

4.6 Continuations and New Starts – Proposal

If the proposal is a continuation of a previous effort, the name of the initial effort should be provided, and the proposal should clearly state that it is a continuation. All new start proposals (no relation to earlier work) should be clearly marked as “New Starts.” All proposals are due no later than **15 June 2007**.

All proposals will be forwarded electronically to the individuals identified below:

Program Manager:

Gary Toth
tothg@onr.navy.mil

Program Officer:

Dr. Wendy Martinez
martinwe@onr.navy.mil

All proposals must also be uploaded to the ONR 31 website: <https://onr31.nrl.navy.mil/cgi-bin/login-form.cgi> . Email messerr@onr.navy.mil for an account.

5.0 Format and Content of White Papers and Proposals

White Paper Format

- ♦ *Paper Size* – 8.5 x 11 inch paper
- ♦ *Margins* – 1 inch
- ♦ *Spacing* – single or double spaced
- ♦ *Font* – Times New Roman, 12 point
- ♦ *Number of pages* – not to exceed ten (10) pages, as described in the “White Paper Content” section
- ♦ *Copies* – e-mail in Microsoft® Office Word, Excel or Adobe Acrobat .pdf format to ONR personnel as specified in Section 4.

White Paper Content

- ♦ **Cover Page:** The Cover Page should reference the C2 and CS D&I program and year. It should also include project title and PI information (name, organization, address, email, telephone number – voice and fax).
- ♦ **Abstract:** A very brief description of the technology including goals and objectives, and technology/thrust areas to be addressed. This section shall be no more than one (1) page.
- ♦ **Technical Concept:** A description of the technology innovation/approach, the Program thrusts addressed, and technical risk areas. This section shall not exceed six (6) pages. Include a detailed listing of the technical tasks/subtasks organized by year. Relate the product that results from the task/subtask, and briefly state metrics that will be met as a result of the task/subtask. In presenting the technical concept, the PI should explain how the technology proposed is relevant to the operational context and impact to the Navy/Marine Corps.

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- ♦ **Deliverables:** Deliverables to be available for experimentation and final project deliverables shall be specifically described, including a description of proprietary components and an assertion of any data rights applicable to the deliverables. This section shall be no more than one (1) page in length.
- ♦ **Costs:** A one (1) page summary of estimated costs segregated by both task and year.
- ♦ **Quad Chart:** Each white paper must include a “quad chart” that contains key program information and notes for use by the Program Manager. A template is included at the end of this document and will be posted to the C2 and CS website (http://www.onr.navy.mil/forcenet_c2csfy08/).

b. Full Proposals

Full Proposal Format – Volume 1: Technical Proposal and Volume 2: Cost Proposal

- ♦ *Paper Size* – 8.5 x 11 inch paper
- ♦ *Margins* – 1 inch
- ♦ *Spacing* – single or double spaced
- ♦ *Font* – Times New Roman, 12 point
- ♦ *Number of pages* –
 - Volume 1 is limited to no more than twenty five (25) pages. Limitations within the Technical Proposal are indicated in the individual descriptions as described in the “Full Proposal Content” Section. The cover page, table of contents, abstract, executive summary, and resumes are excluded from the page limitations. Full proposals exceeding the page limitation may not be evaluated.
 - Volume 2 has no page limitations.
- ♦ *Copies* – e-mail in Microsoft® Office Word, Excel or Adobe Acrobat .pdf format to ONR personnel as specified in Section 4.

Full Proposal Content

VOLUME 1: Technical Proposal

Volume 1 of the full proposal shall include the following sections, each starting on a new page. Sections not included in the page limitation are annotated below. Please pay attention to the page limitations for each section as described below. The page limitation for the technical proposal is twenty five (25) pages.

- ♦ **Cover Page:** (*Not included in page limitations*) This should include the words “TECHNICAL PROPOSAL” and the following:
 - (a) Program Title and Year

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- (b) Title of Proposed Research Effort
- (c) Technology/thrust area to which the proposal is applicable and component of the technology/thrust interest area if the proposal is limited to a component.
- (d) Identity of Prime Performer and Complete List of Subcontractors, if applicable
- (e) Technical Point of Contact (name, address, phone/fax, & e-mail address)
- (f) Duration of Effort and gross proposed cost by government fiscal year
- ♦ **Table of Contents** *(Not included in page limitations)* This should address the contents of the proposal only, generally by section.
- ♦ **Abstract:** *(Not included in page limitation)* A brief description of the proposal including goals and objectives, and technology/thrust areas to be addressed.
- ♦ **Executive Summary:** *(Three (3) page maximum)* A brief summarization of the proposal including the primary areas described below. Emphasis is on the technology in support of FORCEnet, Spiral Development, integration, transition, and relation to other current programs. Finally, a brief statement why your organization would provide the best value to the government for the particular project.
- ♦ **Statement of Work:** *(Three (3) pages maximum)* A Statement of Work (SOW) clearly detailing the scope and objectives of the effort and the technical approach.
- ♦ **Project Schedule and Milestones:** *(One (1) page maximum)* A summary of the schedule of events and milestones, with experimentation milestones clearly indicated.
- ♦ **Deliverables:** *(Two (2) pages maximum)* A detailed description of the results and items to be delivered, including experimentation articles inclusive of the timeframe in which they are to be delivered.
- ♦ **Management Approach:** *(Three (3) pages maximum)* A discussion of the overall approach to the management of this effort, including brief discussions of the total organization, use of personnel; project/function/subcontractor relationships; government research interfaces; and planning, scheduling and control practice. Identify which personnel and subcontractors (if any) will be involved. Include a description of the facilities that are required for the proposed effort. The management plan should show the significant milestones of the technology development process.
- ♦ **Technical Approach:** *(Ten (10) pages maximum)* The PI shall provide a detailed plan that coherently describes the technical approach proposed that demonstrates a technical understanding of the proposed Statement of Work (SOW). The technical approach should address each of the numbered task areas delineated in the SOW providing specific or unique techniques to be employed and anything else the PI considers relevant in performing the SOW. The technical approach should indicate how the work will be performed, including the capabilities and resources which will be applied, what problem areas exist, the proposed solutions and a full explanation of the proposed disciplines, procedures and techniques to be followed. Emphasis should be placed upon the extent that the PI's technical approach ensures timely delivery, and successful completion of the tasks outlined by the SOW submission.

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- ♦ **Personnel:** The PI shall provide resumes of proposed key personnel to be utilized in the performance of this project. The PI shall ensure that the proposed personnel are fully capable of performing in an efficient, reliable and professional manner.
- ♦ **Past Performance:** *(Three (3) pages maximum)* Past performance will consist of a description of the PI's efforts that are similar to the project being proposed. The PI may describe any quality awards or certificates that indicate the PI possesses a high quality process for providing desired research and development outcomes.

For ***Continuing Efforts***, this section will also include a description of the technical accomplishments since the last proposal. The PI should list any papers, book chapters, transition efforts, interactions (other agencies, universities, operational), etc.

VOLUME 2: Cost Proposal

The cost proposal shall consist of three funding tables, as outlined below.

Table 1: Funding History Summary

Performer	Cumulative*	FY07	FY08***	FY09	FY10
Lead Lab in House					
Other Navy					
Other Government					
Industry/Not for Profit					
Total Funding	\$xxx,xxx	\$xxx,xxx	\$xxx,xxx	\$xxx,xxx	\$xxx,xxx

*Cumulative funding includes all previous funding

***Execution Year

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Table 2: FY08 Funding Summary

Budget Category	Funding Requested (\$k)	Category Sum (k)
Personnel Person 1 Person 2 Person 3 <i><u>Total Personnel</u></i>		
Equipment (bundle if under \$5k) Item 1 Item 2 <i><u>Total Equipment</u></i>		
Contracts/Grants Person 1 Person 2 <i><u>Total Contracts/Grants</u></i>		
Miscellaneous Costs Travel <i><u>Total Miscellaneous Costs</u></i>		
Direct and Indirect Costs Contract Fees <i><u>Total Direct and Indirect Costs</u></i>		
TOTAL FY08 PROJECT COSTS	\$xxxk	\$xxxk

Table 3: Contractor/Grantee Data

Contractor/Grantee FY08	Organization & Location	Period of Contract or Grant	Funding (\$k)
Person/Org 1 Person/Org 2			
FY08 Total			\$xxxk

6.0 Evaluation Criteria

White papers and proposals will be evaluated based on the following criteria:

- ♦ Objective that clearly addresses a specified program thrust and states how the project relates to the thrust description.
- ♦ The degree of innovation and ability to deliver technology that will improve warfighting capabilities.
- ♦ Naval relevance, transition potential and anticipated contributions of the proposed technology to FORCEnet and network centric warfare operations.
 - Description of military capability proposed
 - Objectives proposed well connected to an operational concept
- ♦ The soundness of technical concept.
- ♦ The offeror's awareness of the state-of-the-art and understanding of the scope of the problem and the technical effort needed to address it.

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- ♦ Offeror's capabilities, related experience, and past performance, including the qualifications, capabilities and experience of the proposed principal personnel.
- ♦ The quality of technical personnel proposed are consistent with the work proposed.
- ♦ The offeror's experience in relevant efforts with similar resources.
- ♦ The ability to manage the proposed effort.
- ♦ The realism of the proposed cost.
 1. Total cost relative to benefit.
 2. Realism of cost levels for facilities and staffing.

7.0 Schedule of Events:

ANTICIPATED SCHEDULE OF EVENTS		
Event	Date	Time
Pre-Proposal Conference/Industry Day	29 January 2007	TBD
White Paper Due Date	12 March 2007	5:00 PM ET
Notification of Initial Navy Evaluations of White Papers	2 April 2007 *	N/A
Oral Presentation of White Papers	Week of 7 May 2007, exact date TBD	TBD
Notifications of Navy Evaluations of Oral Presentations	28 May 2007 *	N/A
Full Proposal Due Date	15 June 2007	5:00 PM ET
Notification of Selection for Award	2 July 2007 *	N/A
Contract Awards	31 Oct 2007 *	N/A

** These dates and times are estimates as of the date of this announcement. For the date and times, please refer to the C2 and CS website.*

ET = Eastern Time

TBD = To Be Determine

N/A = Not Applicable

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Your LOGO	
<h1>Program Title</h1> <p>Performer, Period of Performance</p>	
<p>Project Description & Approach</p> <p>In PLAIN English, please describe the project:</p> <p>What issues are address, what key technologies/approaches will be used</p> <p>Addresses xx problem....</p> <p>Uses xx technology to support</p> <p>Integrates xxxx....</p> <p>Provides xxxx.....</p> <p>Our approach is xyz</p>	<p>Program Graphic Here</p>
<p>Planned Demos/Deliverables/Transitions</p> <p>What specific products will be generated through this research — algorithms, software, taxonomy, schema, techniques, etc.???</p>	<p>Significance and Warfighter Payoff</p> <p>What impact does the program have on</p> <p>Naval Warfighting? Be sure to specify the naval relevance of the project</p> <p>What is improved, solved, optimized, etc.?</p>
<p>Please review the questions and provide the information requested in the notes section</p> <p>Timeline: Dollars, Demonstrations, Milestones, etc.</p>	

Please use this notes section to expand on the information above and provide additional information requested. Please write in a non-technical, full sentence style so that a speaker could develop ideas from these notes. Requested sections/paragraphs include:

- Background on the problem — what warfighter issues are being addressed/why is this research important
- What program thrust is addressed
- Technical approach to support the project description
- Technical challenges
- Operational issues and payoff
- Relationship to the Network Centric Warfare Taxonomy (specific areas)
- Funding profile
- Accomplishments
- Transition opportunities



Divisions

[C4ISR Page](#)
[Mathematics, Computers, and Information Research](#)
[Electronics, Sensors, and Network Research](#)
[C4ISR Applications](#)

Command and Control (Code 311)**BAA Announcement #07-008;
Command and Control & Combat Systems (C2CS) Discovery and Invention Program - FY08**

Information on the Command and Control & Combat Systems (C2CS) Discovery and Invention Program - FY08 will be posted shortly.

Program Area Links

[Computational Analysis](#)
[Autonomous Systems](#)
[Command and Control](#)
[Intelligent Systems](#)
[Operations Research](#)
[Probability and Statistics](#)
[Software and Computer Systems](#)
[Signal and Image Processing](#)
[Target Tracking and Sensor Fusion](#)

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